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Kirschsteiniothelia shimlaensis sp. nov. from Himachal Pradesh, India

Rajnish Kumar Verma[1*A], I. B. Prasher[2], Sushma[3],
Ajay Kumar Gautam[4], Kunhiraman C. Rajeshkumar[5],
Rafael F. Castañeda-Ruiz[6*B]

[1] *Department of Plant Pathology, Punjab Agricultural University, Ludhiana, Punjab, 141004, India*
[2] *Department of Botany, Mycology and Plant Pathology Laboratory, Panjab University, Chandigarh, 160014, India*
[3] *Department of Biosciences, Chandigarh University Gharuan, Punjab, India*
[4] *School of Agriculture, Abhilashi University, Mandi, Himachal Pradesh, 175028, India*
[5] *National Fungal Culture Collection of India, Agharkar Research Institute, Pune, 411004, Maharashtra, India*
[6] *Instituto de Investigaciones Fundamentales en Agricultura Tropical Alejandro de Humboldt (INIFAT), OSDE, Grupo Agrícola,
Calle 1 Esq. 2, Santiago de Las Vegas, C. Habana, Cuba, C.P. 17200*
* Correspondence to: [A] *vermarajnish1985@gmail.com* [B] *rfcastanedaruiz@gmail.com*

Abstract—A new species, *Kirschsteiniothelia shimlaensis* collected on stumps of *Cedrus deodara*, is described and illustrated. It is characterized by mostly monotretic (rarely polytretic), terminal or intercalary, discrete or integrated conidiogenous cells with solitary conidia that are obovoid, oblong, broadly clavate or cylindrical and dark brown, smooth, and 2–5-septate.

Key words—anamorphic fungi, hyphomycetes, *Kirschsteiniotheliaceae*, taxonomy

Introduction

Himachal Pradesh is situated at 30°22′40″–33°12′40″N 75°45′55″–79°04′20″E. Elevations in the state, a wholly mountainous region in the lap of Himalayas, range from 350 to 6975 m. Himachal Pradesh can be divided into three distinct regions, the [1] Shivalik or outer Himalayas, [2] middle or inner Himalayas, and [3] greater Himalayas or alpine zone. Of the total area (55,673 km^2), 25.8% is under forest cover and offers a vast variety of perennial plants (Balokhra 2011). Since the Himachal Pradesh with different climatic regions supports both tropical and temperate vegetation, the extensive growth of fungi is predictable. Terrestrial saprobic hyphomycetes are an important component of Himalayan forest ecosystem as they play an important role in nutrient cycling. Studies on the fungal diversity of the Northwestern Himalayan ecosystem with particular reference to Himachal Pradesh have been primarily restricted to *Agaricomycetes* (Prasher & Ashok 2013, Ashok & Prasher 2014a,b). There are only few reports of hyphomycetes from this area (Bilgrami & al. 1991, Jamaluddin & al. 2004, Prasher & Verma 2012a,b, 2014a,b, 2015a,b,c). The hyphomycete records reported from this region pertain primarily to plant pathogenic fungi affecting crops (Bilgrami & al. 1991, Jamaluddin & al. 2004). Other new records of hyphomycetous fungi from India have been added by Prasher & Sushma (2014), Verma & al. (2019), and Sushma & al. (2020).

Kirschsteiniothelia D. Hawksw., typified by *K. aethiops* (Sacc.) D. Hawksw., is distinguished by ostiolate ascomata with pseudoparenchymatous peridium of textura angularis to prismatica and composed of subglobose or polyhedral cells. The centrum comprises cellular, branched pseudoparaphyses and bitunicate, fissitunicate, subcylindrical or elongate-clavate asci with (4–)8 ellipsoidal or soleiform, 1-septate, distichously arranged ascospores that are slightly constricted at the septum, brown, verruculose or striate, and covered by a distinct gelatinous tunica. Conidiophores are macronematous; mononematous; erect, straight or flexuous; and branched toward the apex, with the branches irregular or scorpioid. Conidiogenous cells are monotretic, cylindrical or doliiform, mostly discrete (sometimes integrate), determinate or with enteroblastic percurrent elongations, brown. The solitary conidia are cylindrical, obclavate, clavate, oblong, or obovoid; straight or slightly curved; 2 or more septate; and olivaceous-brown, brown, or black (Boonmee & al. 2012 Hawksworth. 1985, Su & al. 2016).

Wijayawardene & al. (2014) demonstrated that *Dendryphiopsis atra* (Corda) S. Hughes (the type of *Dendryphiopsis* S. Hughes) belonged in *Kirschsteiniothelia;* however, further phylogenetic analyses are required to ascertain the correct generic affinities with other *Dendryphiopsis* species. During a mycological survey of microfungi associated with culm, twigs and decaying wood in a Himachal Pradesh forest, a conspicuous fungus was collected, which we propose here as a new *Kirschsteiniothelia* species.

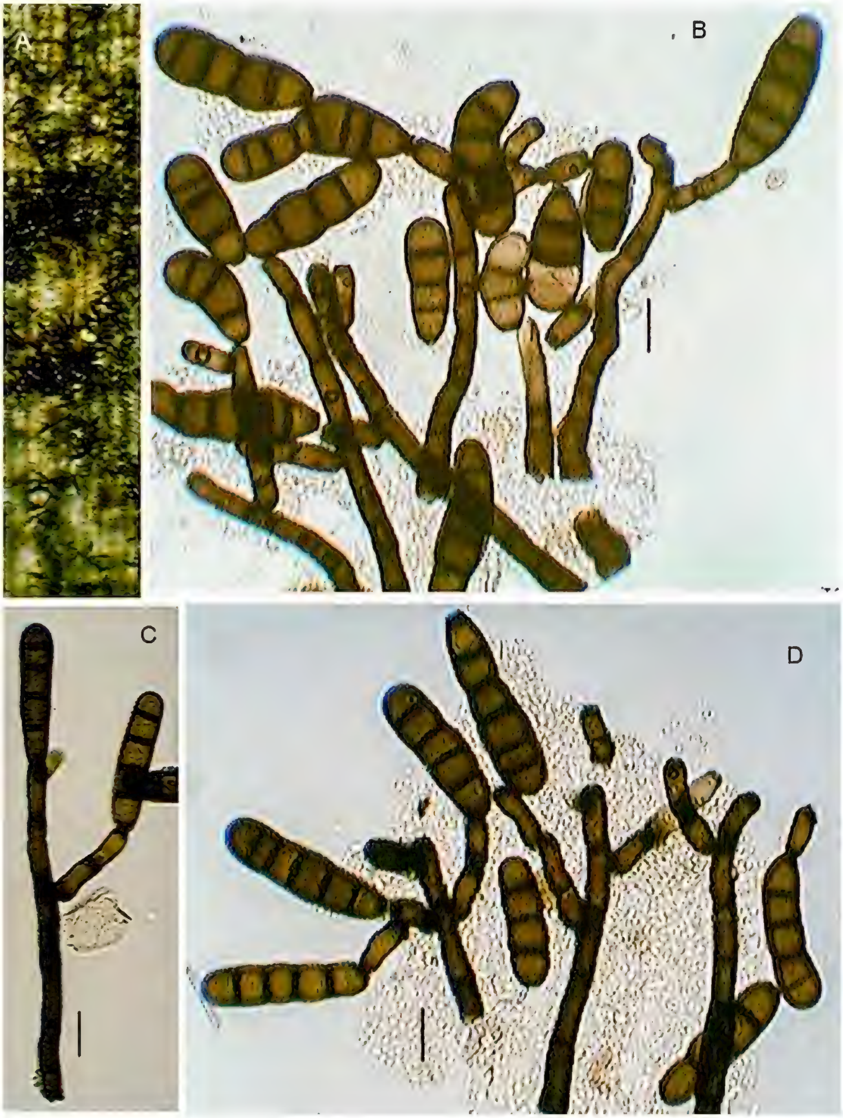

Fig. 1. *Kirschsteiniothelia shimlaensis* (holotype, PAN 30505). A. Colonies on natural substratum. B–D. Conidiophores, conidiogenous cells with attached conidia. Scale bars: B–D = 20 µm.

Materials & methods

Decaying culms, twigs and wood were collected in zip lock bags and taken to the laboratory. The specimens were mounted in 4% KOH, lactophenol, and 0.01% cotton blue in lactophenol (Kirk & al. 2008). The specimens were studied microscopically under Matrix VL–Z60 stereo trinocular microscope and VRS–2f compound microscope. All measurements were taken with ProMED software. The specimen was deposited in the herbarium of Botany Department, Panjab University, Chandigarh, India (PAN).

Taxonomy

Kirschsteiniothelia shimlaensis Rajn.K. Verma, Prasher, Rajeshk., Sushma, A.K. Gautam & R.F. Castañeda, **sp. nov.** FIGS 1, 2

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Differs from *Kirschsteiniothelia atra* by its obovoid, oblong, broadly clavate, narrower conidia.

TYPE: India. Himachal Pradesh: Shimla, Kumarsain, on decaying stump of *Cedrus deodara* (Roxb. ex D. Don) G. Don, 19 Nov. 2016, R.K. Verma (**Holotype**, PAN 30505).

ETYMOLOGY: Latin, *shimlaensis*, referring to the place of collection, Shimla district.

COLONIES on natural substratum scattered, dark, brown to black. Mycelium partly superficial, partly immersed in the host tissue. CONIDIOPHORES macronematous, mononematous, single to loosely fasciculate, erect, straight to flexuous multiseptate, irregular or subscorpioid branched at the apex, dark brown, smooth, 110–268 × 12–19 µm, 7–9 µm wide at the apex. CONIDIOGENOUS CELLS monotretic, terminal or intercalary, cylindrical or doliiform, mostly discrete, determinate, sometimes with enteroblastic percurrent elongations, smooth, dark brown or brown, 18–24 × 8–10 µm. CONIDIA solitary, obovoid, oblong, broad clavate or cylindrical, sometimes constricted near the middle or at the supra basal cell, sub-truncate or rounded at the base, rounded at the apex, dark brown or black, smooth, microguttulate, lumen aspect granulose, 2–5(–6)-septate, 41–81 × 13–17.5 µm.

Discussion

Kirschsteiniothelia shimlaensis is superficially similar to *K. atra* (Corda) D. Hawksw., which differs in its mostly cylindrical, pale to mid-dark smoky or olivaceous brown, and wider (12–25 µm) conidia (Ellis 1971, Hughes 1953, 1958; as "*D. atra*"). *Kirschsteiniothelia shimlaensis* also differs from *K. lignicola* Boonmee & K.D. Hyde which has ellipsoidal to obovate, 2-septate conidia, and *K. emarceis* Boonmee & K.D. Hyde which has oblong to obclavate, 3–4-septate conidia (Boonmee & al. 2012.

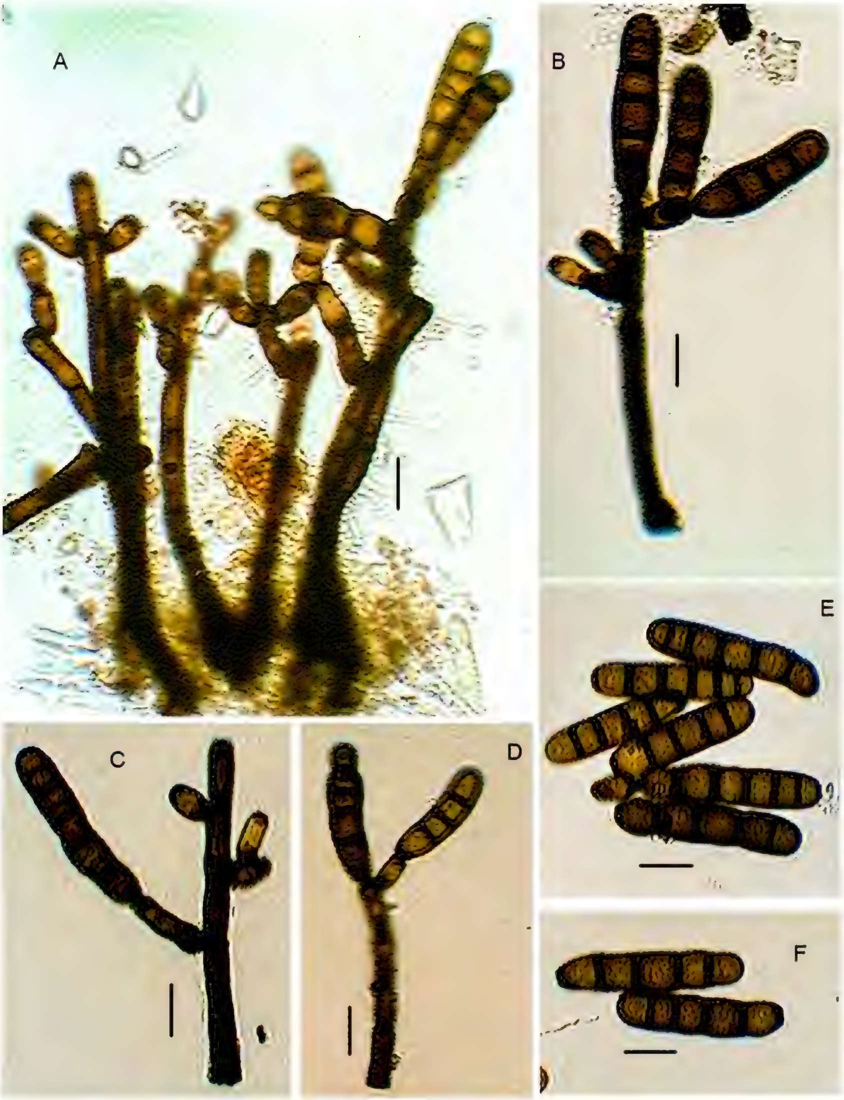

FIG. 2. *Kirschsteiniothelia shimlaensis* (holotype, PAN 30505). A–D. Conidiophores, conidiogenous cells with attached conidia. E,F. Conidia. Scale bars = 20 µm.

Dendryphiopsis goaensis J. Pratibha & al., shares a somewhat similar conidial morphology with *K. shimlaensis,* but *D. goaensis* has mostly cylindrical, dark brown, 20–40 × 5–7.5 µm conidia, frequently produced in polytretic conidiogenous cells (Pratibha & al. 2010). Other *Dendryphiopsis* species comparable with *K. shimlaensis* are *D. arbuscula* (Berk. & M.A. Curtis) S. Hughes, *D. binsarensis* Subram. & V. Srivast., and *D. fascicularis* (Berk. & Ravenel) S. Hughes; *D. arbuscula* is distinguished by conidia that are subfusiform, fusiform or obclavate 3-7-septate, blackish olivaceous, 50–80 × 14–17 µm (Berkeley 1875, Ellis 1976), *D. binsarensis* has obclavate to obclavate-fusiform, 3-7-septate, brown conidia, 36–44 × 8–10 µm (Subramanian & Srivastva 1994), and *K. fascicularis* has long-clavate conidia, strongly attenuated at the base (Berkeley 1875, Hughes 1958).

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